Risk reduction with information about reactions of industries to booms and recessions.

B.Sc. Thesis

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Abstract

Most empirical studies of the CAPM assume that Betas remain constant over time, but in this research I will use the conditional CAPM, where Betas fluctuate over time. In this thesis I investigate the relation between values of Betas from several industries and the business cycle. The information of this relation is linked to cyclical movements of industries and the whole business cycle. The reaction of each several industry is different, they vary during Booms and Recessions, some of them are procyclical or countercyclical or non cyclical. The aim of this research is to check or this information can be used to reduce the risk on doing investments in stocks/portfolios.

Chapter 1

Introduction

The economy never stands still, there is always something happening. Reality we have had the financial crisis which of course impact on the financial markets. Banks came in trouble and investors lose a lot of money on their investments in the stock market. There are a lot of ways and methods to predict what will happen in the market, but there is not just one way that is correct. Predicting what will happen with the stock market is subjective, and only after time it is possible to say what was the right prediction. Although that, predictions are a well used approximation by investors.

The main topic of this thesis is the relation between the expected return and the Beta and use this information for predicting what will happen in the market. In this thesis there will be not used a standard technical analyze, but in this research I will try to use information about how several industries react to booms and recessions. Are different industries procyclical or countercyclical to the expected return of the market or maybe there is no reaction with the business cycle.

The main method in this research will be the capital asset pricing model (CAPM) of William Sharpe (1964) and John Lintner (1965). The attraction of the CAPM is its powerful simple logic and intuitively pleasing predictions about measuring risk and about relations between risk and return. The capital asset pricing model is often criticized, but since a few years there is a new

way of testing the expected return and risk, namely the conditional CAPM. In the research part of this thesis, I will use the conditional CAPM, because I believe Betas vary over time. The Beta will be the indicator of measuring the risk in different portfolios.
After all, Betas serve as a benchmark for investments decisions.

Hypothesis

Is it possible to reduce risk from investments in the stock market by using information about the reaction of several industries (is the Beta of several industries systematic risk?) to booms and recessions?

The purpose of this, is that by comparing Betas of several industries with the expected return of the market it is possible to determine how industries react to booms and recessions. Are they procyclical or countercyclical, non cyclical or do they follow the market. With this information I will try to predict what will happen, with the value of an industry portfolio. Could the information be used, to reduce risk by investing in the stock market? I believe this question can be answered positive, because I think that there is a relationship between the Beta of several industries and expected return.

To investigate this topic, this thesis will be divided in different chapters. I will start with a literature overview in chapter 2. In the literature, the most important terms (that are needed to make predictions of the stock market) will be discussed. Like CAPM, Conditional CAPM, Betas, Systematic risk and procyclical and countercyclical. In chapter 3, I will give a global explanation of my research and I will describe the research method and you will find the data which is used for the empirical research. After that I will do a small empirical research and give the results of the empirical research in chapter 4. There will be an overview of all the estimated Betas and the correlation with the business cycle will be given. After that I show the regressions per industry that I made and will analyze them. In chapter 5 I formulate a conclusion about how several industries react to booms and recessions and or it is possible (with this information) to predict what will happen with the value of different industry portfolios. And of course or it is possible to reduce risk on investments with this information.

Chapter 2 Literature overview

2.1 Capital asset pricing model

The capital asset pricing model also called (CAPM) is original proposed by William Sharp (1964) and John Lintner (1965). The CAPM theory provides a theoretical structure, for the pricing of assets with uncertain returns. Accordig to Bollerslev, Engle and Wooldrigesource (1988) the theory predicts that the expected return on an asset above the risk-free rate is proportional to the systematic risk (systematic risk will be discussed later in the literature).

The CAPM theory has been used for several years and is still the most widely used theory to estimate for example the cost of capital for firms and evaluating the performance of managed portfolios.

There are alternative theories of asset pricing such as the arbitrage pricing theory of Ross (1976) and the three factor model (Eugene Fama & Kenneth French) or the consumption beta formulation which is introduced by Breeden (1979). In general the CAPM theory could be seen as the basis for all the other theories and the CAPM theory is often the only pricing model that is used. In this paper the CAPM theory is the basis and the conditional CAPM receives special attention (this will be discussed in chapter 2.5).

The Capital Asset Pricing Model is an economic model for valuing stocks, securities, derivatives and/or assets by relating risk and expected return. The CAPM is based on the idea that investors demand additional expected return (called the risk premium) if they are asked to accept additional risk.

The risk has an effect on the interest rate. How more risk, the higher the interest rate will be. In the CAPM formula the Beta will be used to determine what the risk factor is. For individual security perspective we use the Security market line (SML) and its relation to expected return and systematic risk (Beta), to show how to price an individual security in relation to their security risk class (so it can be, discounted at the right interest rate). (see also the graph in figure 1).

The Securities Market Line (SML)

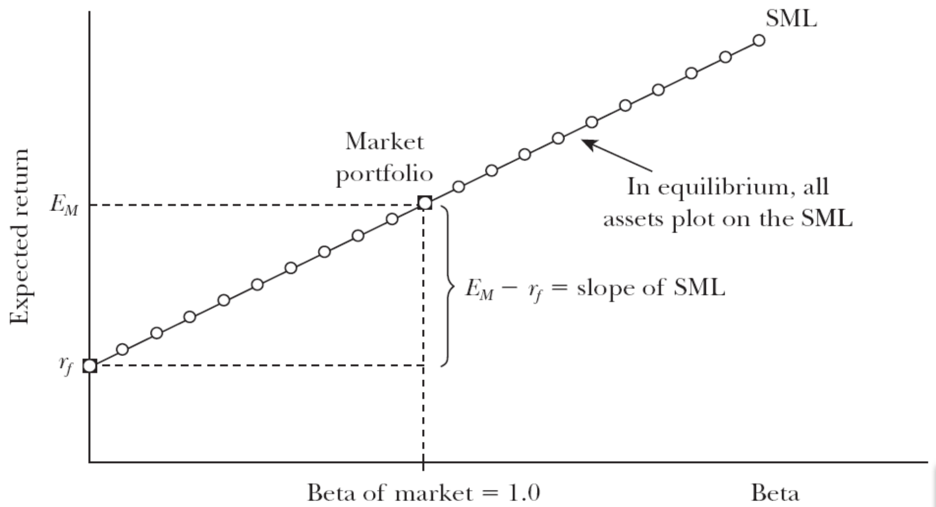


Figure 1

2.2 Formula of the CAPM

After I discussed earlier in chapter 2 the CAPM formula in theory, I discuss here the derivation from the CAPM formula. Hereby I take the derivation in the simplest form. The CAPM formula is: Expected security return = Riskless Return + Beta *(Return on the Market-Risk free rate) or in a formula:

$$E(R_i) = R_f + \beta_{im}(E(R_m) - R_f).$$

Where:

- $E(R_i)$ is the expected return on the capital asset
- R_f is the risk-free rate of interest
- β_{im} (the *beta coefficient*) the sensitivity of the asset returns to market returns,

$$\beta_{im} = \frac{\mathrm{Cov}(R_i, R_m)}{\mathrm{Var}(R_m)}$$

- $E(R_m)$ is the expected return of the market
- $E(R_m) - R_f$ is the market risk premium

2.3 Assumptions of the CAPM

The CAPM model uses some assumptions for asset pricing and investors behaviour. They do this so it is possible to value stocks, securities, derivatives and/or assets by relating risk and expected return on a theoretical approach. In this paragraph you will find the most important assumptions that are made. These understanding assumptions that I use are based on Fama and French (2004), and Falahati (2010).

Investors are risk averse individuals, who maximize the expected return of their end of period wealth, so the assumption is that the basic CAPM is a one period model. This is a theoretical approach, but in a real dynamic world this assumption is not valid. They also approach that there are a definite number of assets and their quantities are fixed within one period. Investors have also homogeneous expectations about returns because the assumption is made that everyone has the same information. And all assets are perfectly priced in a perfectly competitive market. After that they assume that asset markets are frictionless and all information is costless and available to all investors and that there are no market imperfections, such as taxes. At least they assume that investors may borrow or lend unlimited amounts at the risk free rate.

Although the assumptions mentioned above normally are not valid or met, CAPM remains one of the most used models to determine risk and return.

After the earlier discusses assumptions of the CAPM it is to imagine that there are some doubts about using the model in practical. According to Perold (2004) the Capital Asset Pricing Model is an elegant theory with profound implications for asset pricing and investor behaviour. In this article they ask how useful the CAPM model is, given the idealized world that underlies its derivation. They came with several answers.

- It is possible to examine whether real world asset prices and investor portfolios conform to the predictions of the model, if not always in a strict quantitative sense, and least in a strong qualitative sense.
- Even if the model does not describe our current world particularly well, it might predict future investor behaviour.
- The CAPM can serve as a benchmark for understanding the capital market phenomena that cause asset prices and investor behaviour to deviate from the prescriptions of the model.

This approach works very well in theory, but in practical we live in a dynamic world, and not all the assumptions of the basic CAPM are always valid. So there is some discussion or the CAPM works well in practical and there is also an update, namely the Conditional CAPM. In this empirical research I will follow the Conditional CAPM. The Conditional CAPM will be explained in paragraph 2.5.

2.4 Systematic risk

In the empirical research, one of the main questions will be if the Beta could be defined as systematic risk. When the Beta could be defined as systematic risk, it would be possible to reduce the risk for investments. In this paragraph the topic systematic risk and idiosyncratic risk will be discussed and makes clear what both means and what the difference between these two is. Also the way how it is possible to reduce risk by diversification will be discussed and the effect that it will have on systematic risk and idiosyncratic risk.
Investors are risk averse and prefer high returns, therefore they try to adopt any strategy that allows them to decrease risk, with holding the same expected return. According to Campbell R. Harvey and Stephen Gray 1997 diversification is a strategy to decrease the risk without decreasing the expected return, so most people will hold diversified portfolios.
In the understanding graph is shown how diversification in the simplest form could be explained. In the graph in figure 2 you can see a set of risky assets and also the choice of two investors, namely investor A and investor B. By combining these two assets it is possible to diversify the risk of these two investment possibilities and create a ‘new’ choice to invest in.

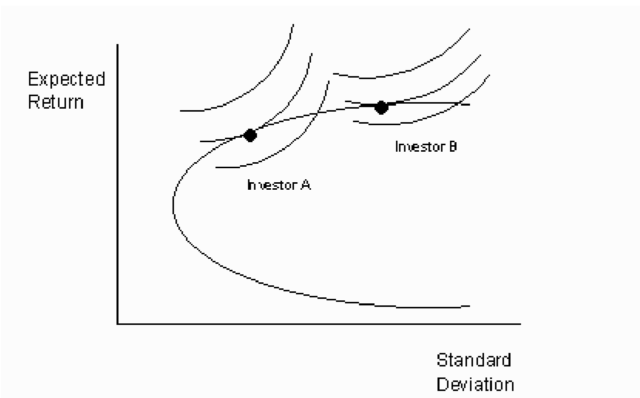


Figure 2

In the above figure (figure 2) are only risky assets shown, but it is also possible to combine with a risk free asset. An investment in the market portfolio and the riskless asset is an optimal strategy for all investors, there will be only a difference in the proportion invested in the market portfolio and the riskless asset. (You can see it in figure 3: the straight line from Rf to M).
This holds only when the assets and portfolios returns are perfectly positive correlated with those of the market portfolio. In the real world this is not a fact, it is also possible that asset and portfolio returns are negative correlated with those of the market portfolio. This give us an extra opportunity, by combining two assets one that is positive correlated with those of the market and one that is negative correlated with those of the market. In that case the state of the economy makes not a very important sense, because one of the assets will give a high return in a recession and the other gives a high return during a boom. By combing these, there will be less risk and a relative high expected return. (you can see this also in a graph in figure 3)

Capital Market Line (*CML*).

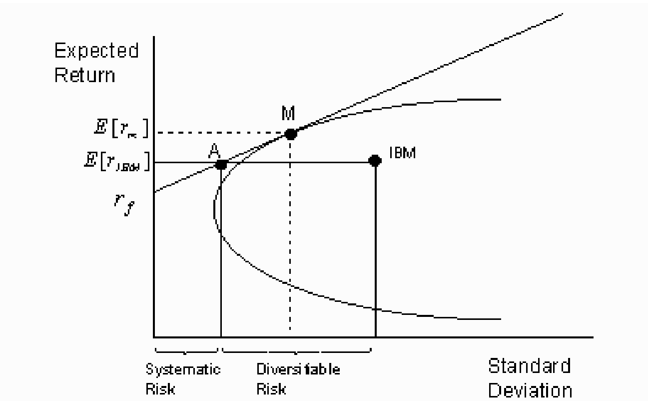


Figure 3

For example (This example is based on Campbell R. Harvey and Stephen Gray 1997) in the above graph (figure 3) you can see an asset of IBM and an asset A, which is a combined portfolio of Rf and the market portfolio. Every risk-averse investor will prefer A above only an asset IBM, because the expected return is in both cases the same, but the risk of asset A is lesser. It is also not possible in this case to find an asset with the same expected return and less risk than asset A. The total risk of IBM can be decomposed into systematic risk and diversifiable risk. Systematic risk is the minimum risk required to earn a certain expected return. Diversifiable risk also known as idiosyncratic risk is the proportion of the risk that can be eliminated, with holding the same expected return, simply by diversifying. All investors are rewarded for bearing this systematic risk, but they are not rewarded for bearing idiosyncratic risk, because this can easily be eliminated without any cost.

As shown in the formula of the basic CAPM, they multiply with the return of the market – the risk free rate. This is the premium for the risk that is taken. According to Cox Griepentrog it is logical that the security risk premium should reflect both the systematic and unsystematic risk. When investors are able to diversify their portfolios to a less than perfect degree, the risk measure should generate a risk premium that embodies systematic and unsystematic risk, and investors are forced to accept because of market constraints.

The Beta of the portfolio is the defining factor in rewarding the systematic exposure taken by an investor. The CAPM assumes that when the risk-return profile of a portfolio can be optimized; the optimal portfolio displays the lowest possible level of risk for its level of return. As earlier said every asset introduced into a portfolio further diversifies the portfolio, the optimal portfolio must comprise every asset, (assuming no trading costs) with each asset value-weighted to achieve the above (assuming that any asset is infinitely divisible). All such optimal portfolios, comprise the efficient frontier.

Because the unsystematic risk is diversifiable, the total risk of a portfolio can be viewed as Beta.

2.5 Conditional CAPM

The CAPM as derived above in part 2.1 - 2.3 is the basic CAPM model. The CAPM was derived by examining the behavior of investors in a hypothetical model-economy, in which they live just for one period. But it is well known that the CAPM Beta is not stable over time, but vary substantially over time. Therefore the basic CAPM makes assumptions and one of them is that Betas are constant over time. In this paper I view this in a way, that this is not a particularly reasonable assumption, because risk of the firms' cash flow may vary over the business cycle (For example during a recession)

According to Groenwold and Fraser 1999, the Beta is a parameter that plays a central role in modern finance, to measure the risk of assets. Estimating Beta's is a difficult process, because a Beta is not observable and there is not one right way to estimate Betas. In Common Betas will be estimate over short time, so the prediction of the Beta will be narrower. The Beta is needed in the CAPM formula and the CAPM works better over short periods (the Beta that is used in the CAPM is narrower) than over long periods.

To summarize the difference between CAPM and Conditional CAPM you can say that by using the standard CAPM the Beta will be constant over time and when using the Conditional CAPM, the Beta is not constant over time, but will be fluctuating over time.

2.6 Why and how do Betas Move

Earlier in this paper is shown that the Beta in the Conditional CAPM fluctuate over time. In this part will be discussed, why and how Betas move. There is not one typical reason, but there are more factors that have influence on the value of the Beta. The different reasons will also be discussed and explained.

According to Santos and Veronesi 2004 the Conditional Betas depends on different factors. They show that Conditional Betas depend on the level of the premium itself; the level of firms expected dividend growth; and the fundamental risk of firms. Fundamental risk of firms is the one pertaining to the covariance of firms cash flows and the aggregate economy. This characterization yields new predicts for the time variation of Conditional Betas. So when the cash flow risk of a firm is substantial, the model should display also a large time variation of Conditional Betas. To support this it is useful to consider first an asset that has little cash flow risk. In that case the, the risk and return are almost only determined by the timing of the cash flows. This is also called the duration. An asset that pays far in the future is more sensitive to fluctuations in the discount rate. Clearly the volatility that is due to shocks in the discount rate is systematic. The consequence is that the asset is more risky, thus the Beta will be higher the longer its duration.

When an asset has substantial cash flow risk this intuition does not go through. For example consider an asset whose cash flow rate is highly correlated with the aggregate economy and furthermore assume a low duration. In that case the value is mainly determined by the current value level of cash flows. So the price of an asset is most driven by cash flow shocks, but they are also driven by fundamental risk which is embedded in cash flows. Thus when cash flows display substantial fundamental risk, the Beta will be higher when the duration is lower. If an asset has a high duration, current cash flows matter less, and an asset become less risky. These findings highlight a tension between the discount effects and the cash flow risk effects. The Conditional Beta is now split up in two components, the discount and the cash flow Beta. The overall Beta is driven by whether the discount or the cash flow beta is more important. When the cash flow Beta is more important, they show that the cross sectional dispersion of Betas correlates negatively with the aggregate discount. They link also investment decisions to changes in Betas and find that Strong cash flow effects correlate positively with changes in Betas.

The underlying cash flow process; the asset duration and also the covariance of an assets cash flow with the state of the economy are very important. They conclude that the Beta is a relevant cash-flow parameter.

The way why and how Betas move, depends on more factors, but in this paragraph a general explanation will be shown that includes the above summed reasons, but here it is formulated in a more general way. Later in this paragraph will be discussed, why the conditional CAPM is preferred above the basic CAPM model. According to Jagannathan and Whenyu 1996 the business cycle is induced by technology or taste shocks, the relative share of different sectors in the economy fluctuates, inducing fluctuations in the betas of firms in these sectors. And betas and expected returns will in general depend on the nature of the information available at any given point in time and vary over time. They say also that there are two major difficulties in examining the support of the statistic CAPM, the real world is dynamic and not statistic and second the return on a portfolio of aggregate wealth is not observable. They say that the

assumption that is made in the basic CAPM, that Betas remain constant over time and the return on stocks measures the return on the aggregate wealth portfolio are not reasonable.
They assume in there formula from the conditional CAPM that the expected return is a linear function of the expected Beta. However the conditional risk premium on the market and the conditional Betas are correlated. During bad economic times when the expected market risk premium is relatively high firms are more likely to face financial difficulties and that is one of the reasons why they have higher Conditional Betas. But if the uncertainty associated with the future growth opportunities is the cause of a higher Beta from the firm then Conditional Betas will be relatively low during bad economic times. This is because during bad economic times the uncertainty and the value of growth opportunities will be reduced and this will affect more than the effect of increasing leverage. But in fact, we know that the risk premium and Conditional Betas are not constant over time. Therefore the unconditional expected return is not a linear function of the expected Beta alone. So they also decompose the conditional Beta in two components, just like Santos and Veronesi.

The difference of using the CAPM for an theoretical or a practical way is the main reason for using the Conditional CAPM, because we are dealing with a dynamic world. The preferred Conditional CAPM (in practical) is an update of the basic CAPM and is meanwhile tested by other researchers. In this paragraph you find some findings of different researches.
According to Jagannathan and Whenyu 1996 the conditional model performs better than the static model. They argue that after a simple empirical research, but there must be caution of interpreting these results. In there research they used rather simple modeling of the time variations in Betas and second a number of events occur at deterministic monthly and yearly frequencies. But we have to keep in our mind that the CAPM, like any other model is only an approximation of reality.
According to Groenewold and Fraser 1999 (after they did also an empirical research to Conditional CAPM, especially how to estimate Betas for sub-periods) they state considerable time variation in the estimated Betas and that many or not stationary. After all they say both that for implementing the CAPM, for practical purposes, it is commonly assumed that the return of a value weighted portfolio of all stock listed on the stock exchange market are a good indicator to estimate the return on the market portfolio of all assets. In this research I will use the GDP as the

indicator to estimate the return on the market portfolio of all assets. In earlier researches to Conditional Betas almost every researcher conclude that a constant Beta is very good for an theoretical approach, but in practical using a fluctuating Beta is much narrower. For predicting what will happen with the value of several industries, we also use the conditional CAPM in this research. The Formula for estimating a Time-varying Beta will be estimate in the empirical study of this research.

2.7 Procyclical and countercyclical

Because in the approach of this research Betas fluctuate over time, it is the aim of this research to analyze the reaction of the Betas of several industries to booms and recessions.

In this paper I will try to find or there is a relation between Betas and the expected return of several industries. To measure how they react to booms and recessions I will speak about two terms, namely procyclical and countercyclical. According to Chevalier and Scharfstein 1996 these two terms are the main used terms. With procyclical I mean the way like the Beta move will have a progressive reaction to the state of the economy and with countercyclical I mean that the Beta will move against the state of the economy. Off course it is also possible that industries do not react to the business cycle. In that case the business cycle is a good approximation for that industry. In the economy we are dealing with booms and recessions, by analyzing how Betas react in different phases of the economy it will be more likely what will happen with the value of stocks from firms in different industries. With this information it would be also more easily to benchmark several industries with each other.

There are different theories about how the reaction will be in different phases of the economy. According to Chevalier and Scharfstein 1996 there are models of business cycles based on aggregate demand shocks, that imply that during booms, factor prices fall relative to output prices. This follows from the assumption that, at high output levels, marginal products are low. During booms, prices of wages and raw-material rise to relative output prices, which means that real factor prices are procyclical. Chevalier and Scharfstein derive from other papers that imperfect competition can reconcile procyclical real factor prices driven business cycles. These papers build on the old idea in Pigou (1927) and Keynes (1939) that increases in aggregate demand may have little effect on prices. So they say that firms behave more competitively during booms and the real factor price will rise.

They also make three distinctions why markups may be countercyclical. They say that demand become elastic during recessions, allowing imperfectly competitive firms, to increase markups. According to Rotemberg and Saloner (1986) and Rotemberg and Woodford (1991, 1992) firms are less able to collude during booms. This is because when the demand is high, firms will be more incentive to cut prices. Firms prefer short-run profits of market share above the long run profits from collusion. At last according to Klemperer (1993) and Cottfries (1991) markups may be countercyclical because of capital market imperfection. By that they mean that firms will try to boost the current profits to meet their liabilities and also for financing investments. They may do that by increasing prices and attempt to build up market share.
In the research part I will not focus about why the reaction is in a certain way, but I will generalize it and will focus only on the way how the reaction will be in different phases of the economy. For example is the Beta higher during recessions or lower during recessions.

Industries will react in several ways to the business cycle. According to Boudoukh, Richardson and Whitelaw, Betas will vary across assets depending first on the correlation between the assets expected dividend growth and the expected inflation and second the volatility of the asset on it self. They state that there are strong reasons to believe that these population moments will vary across stocks in different industries. For example they give the example that the expectation of industries that or involved in the manufacturing of durable goods are highly procyclical. While other industries (Such as those that provide necessities) are much less so. To the extent that expected inflation is related with the aggregate economy, the correlation should vary across cyclical and noncyclical industries. The magnitude of this relation depends on the variability of expected growth rates of cash flows, which will also depend on the characteristics of the industry. They also did an empirical research what is similar with this research. They investigate the relation between several industries and the inflation. What strikes in there results is that almost al the industries are negatively correlated. Only the industries Tobaco, Mining and Nonelectrical Machinery are positive correlated. In the empirical part of this research I am going to do a similar research and will also test the relation between several industries and the business cycle.

Chapter 3 Research & Data

3.1Research

In the literature review of this thesis, I discussed the difference between the CAPM and the Conditional CAPM. The Beta is the main difference, because the Beta fluctuates over time when using the Conditional CAPM. To answer the main question of this thesis, I am going to do research to the relation between the Beta of several industries (Conditional Betas because they fluctuate over time) and the business cycle. With the outcome of the empirical research, I am going to analyze or the Beta could be defined as systematic risk or it is possible to(with the Beta information of several industries in relation with the business cycle) 'decrease the systematic risk'. Because when there is a significant relation, it would be less riskier for investors to invest in portfolios (which react procyclical or countercyclical or do not react), because the predicting what will happen with a stock/portfolio would be narrower, so the risk will be lower.

3.2 Data

The data that I use in the first part of the empirical research comes from the Kenneth R. French Data library. With this data I am going to estimate the Betas of several industries. I will use data that contains daily valued and equal weighted returns for 10 industry portfolios, and I will use the data from 1990 till 2010, because I think the data will be large enough to investigate the relation with the business cycle and also will be large enough to find or the results are significant. The other dataset that I need for calculating the Beta, is the expected return of the market. This data comes also form the Kenneth R. French Data library. This data is also daily and also gives the risk free rate at any point in time.

The industry Betas can be calculated with the above information, but I also need data that gives a good view on the economic business cycle of the last 20 years. For that I will use data of the Gross Domestic Product (GDP), because episodes where the GDP falls are closely related to recessions and vice versa. The GDP would give a good view of the economic business cycle.

3.3 Research method

The first step that I take is estimating the Betas per industry. The data that I have is daily, but I am going to estimate industry Betas from 1990 till 2010, so to make it more clear I will estimate quarterly Betas per industry. The formula that I will use for estimating the industry Beta is:

$$\beta_{im} = \frac{\mathrm{Cov}(R_i, R_m)}{\mathrm{Var}(R_m)};$$

Where

- β_{im} (the *beta coefficient*) the sensitivity of the asset returns to market returns,
- *Ri is the return of an industry*
- *Rm is the return of the market*

Of course the *Ri and Rm are minus the risk free rate*

All the information that is needed for this formula is in the data that I am going to use, so with this formula I can calculate (quarterly) the Betas. Of course I will do that for every industry.

Once I have calculated the Betas I have to calculate the Correlation between the Beta of an industry and a variable which is a good parameter for the business cycle. As already said in the paragraph 'data', I will use the GDP as parameter for the business cycle. The formula that I am going to use to estimate the correlation between the β_{im} and the GDP is:

$$\rho(X,Y) = \frac{\mathrm{cov}(X,Y)}{\sigma(X)\sigma(Y)};$$

Where

- *ρ(X,Y) is the correlation between a variable X and Y(in this case* β_{im} and the GDP)

When the correlation is positive the effect is that the industry will be higher during a recession and when the correlation is negative the effect is that the industry will be lower during a recession. When the correlation is very close to zero, it will mean that industries do not react to recessions.

When I have calculated the above for all industries I am going to make regressions. The dependent variable will be the β_{im} and the independent variable will be the GDP. For all the industries I am going to make a regression so it would be possible to analyze them. The formula that I am going to use is comparable with a classic regression ($Y = \alpha + \beta x$). In this emperical research the used formula for making a regression will be:

β i,t = Y0 + Y1 GDPt;

Where

- *Yo = a constant*
- *Y1 = coefficient Beta*
- *GDP = here I will use the growth of the gross domestic product*

Because I want to check the confidence of this research, I will also check the significance per regression. (Because the assumption of the standard error in this regression is zero, the standard error is not shown in the formula).

Chapter 4 Empirical results

4.1 summary statistics of estimated Betas

The First calculation that I made, are the Betas per industry from 1990 till 2010. Because I estimate quarterly Betas there are still a lot of Betas, and to make it more clear I made a statistical summary of the Betas. I chose for the Mean, Median, Quartile and Skew. (The Betas of all industries per quarter are attached in the attachment).

Summary of statistics

	Mean	Median	Quartile 0	Quartile 1	Quartile 2	Quartile 3	Quartile 4	Standard deviation	Skewed
oDur	0,725	0,706	-0,007	0,553	0,706	0,936	1,270	0,265	-0,266
Durbl	1,087	1,116	0,390	0,913	1,116	1,283	1,797	0,278	-0,287
Manuf	0,953	0,978	0,469	0,893	0,978	1,056	1,289	0,153	-0,868
Enrgy	0,779	0,731	-0,063	0,549	0,731	1,039	1,847	0,351	0,192
HiTec	1,373	1,302	0,768	1,150	1,302	1,566	2,689	0,360	1,080
Telcm	0,928	0,900	0,589	0,790	0,900	1,038	1,400	0,181	0,778
Shops	0,976	0,971	0,443	0,826	0,971	1,112	1,359	0,206	-0,164
Hlth	0,881	0,896	0,189	0,672	0,896	1,093	1,499	0,300	-0,152
Utils	0,577	0,549	0,027	0,411	0,549	0,743	1,274	0,265	0,287
Other	1,036	1,010	0,671	0,943	1,010	1,079	1,590	0,153	1,191

Figure 4

In the statistical summary I chose for the most used indicators where the mean gives in my opinion the best view of the results of the whole sample. Most striking in the table is the difference of the average Beta of the several industries. As you can see in the summary statistics table the Median and Quartile 2 are exactly the same, because they are both the middle of the spread. The standard deviation is also in the table, because it is a good indicator for the spread of the results. I also chose for the indicator ‘quartile’ because it gives a good view of the total spread. The spread (of the indicator quartile) is build up like the understanding figure (figure5).

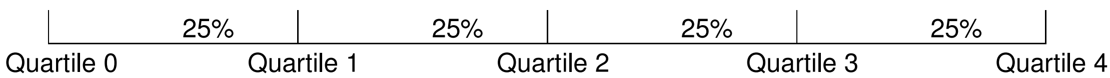


Figure 5

4.2 Correlations

The correlation indicates how strong the relation is between an industry and the quarterly growth of the GDP. As discussed in paragraph 3.2 the GDP is closely related to booms and recessions. The GDP gives a good view of the economic business cycle.

Correlation between βi and GDP

	GDP annualized growth rate	Sig (2-tailed)
oDur	0,105	0,349
Durbl	-0,184	0,097
Manuf	-0,210	0,058
Enrgy	-0,090	0,420
HiTec	0,217	0,050
Telcm	-0,135	0,028
Shops	0,024	0,826
Hlth	0,277	0,012
Utils	-0,081	0,468
Other	-0,421	0,000

Figure 6

In the above figure 6, I show the estimated values of the correlation of several industries in relation to the GDP. I also put the (2-tailed) significance of these correlations in the table, so it is possible to see which correlations are the most (significant) valuable. When the value of the correlation is positive, it means that the Beta of that industry is procyclical. When the economy goes well, also the value of the Beta will increase. When the value of the correlation is negative it means that the Beta of that industry is countercyclical. When the economy goes well, the value of the Beta will decrease. The last option is when the value of the correlation is close to zero. That means there is no reaction to the business cycle.

When I analyze the results of the several industries there are some notable differences between the several industries. The industries Hlth and Hitec have the highest positive value that means that these two Betas react at most procyclical to the GDP. Another notable value is from the industry ‘ Other’, the value of this correlation is the most negative correlation, with means this industry will react countercyclical to the businesscycle. The value of the correlations from the industries Enrgy, Shops and Utils are very close to zero. This means there is almost no reaction to the business cycle. In the next paragraph I will estimate regression for each of the industry, So I can check in a more confident way what the relation, between the several industries and the GDP will be.

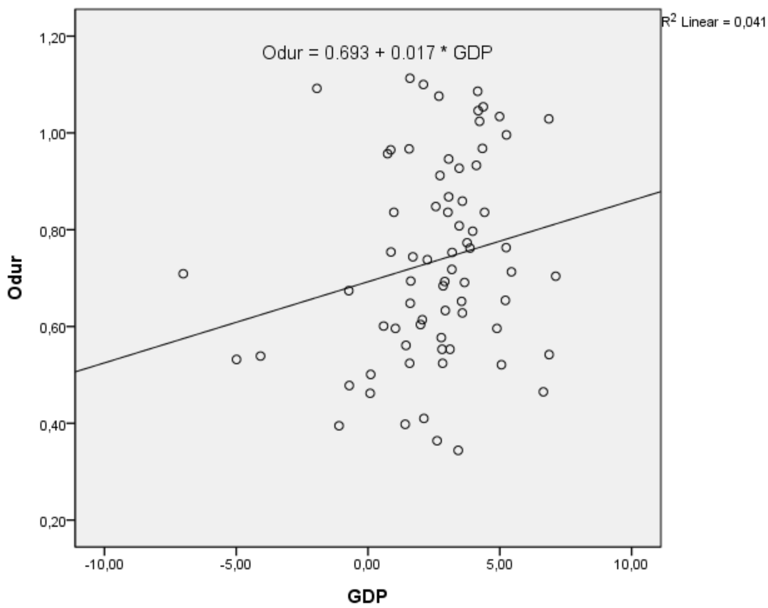
4.3 Regressions

After calculating the Betas per industry and estimating the correlation between the Betas per industry and the quarterly growth rate of the GDP, I estimate linear regressions. I made for every industry (in relation to the growth rate of the GDP) a regression line, so in total I made 10 regressions. In every regression that I made, the dependent variable is always the Beta of the industry. The independent variable is in every regression that I made the same, it is always the variable quarterly growth rate of the GDP.

To make the regressions narrower I subtract from every variable 'industry Betas' the outliers. The reason for that is that there are always excessive values, because of events that rarely occur and cannot be explained by the model.

In this part I am going to analyze per regression what stands and what the signification of the regression is. The equation of the regression is shown above in every graph.

Figure 7

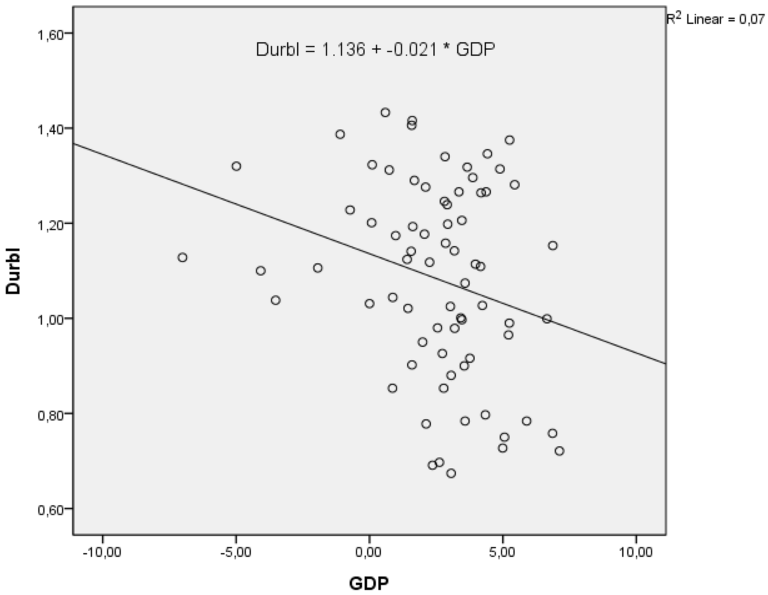


The first regression is made for the industry 'Odur' (figure 7). What is striking in this regression is the positive regression line. Thus, the Beta of Odur will increase when it goes well in the economy in other words you could say that it is procyclical. But there must be noted that the positive correlation is (R^2 = 0.041) not strong. The different Betas in time are not very close to each other but or spread. The signification of this regression is 0.088; this means that this finding is made with about 92% confidence. To be narrower, I also made a T-test for every regression.

The outcomes per regression are shown in figure 17 Later in this chapter. I will discuss the results of the T-test (per industry) on the end of this chapter.

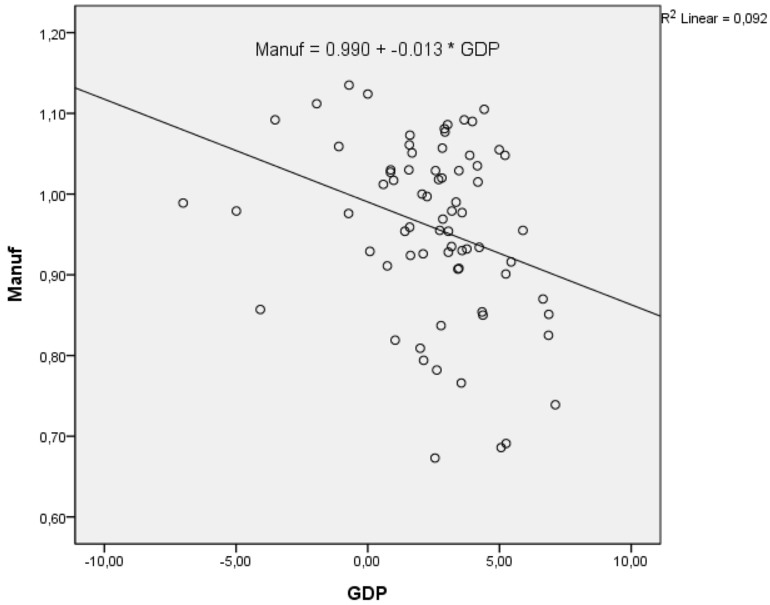
The understanding regression is of the industry Durbl in relation with the quarterly growth rate of the GDP (figure 8). The regression line is negative that means that the Beta of the Durbl industry will decrease when it goes well in the economy. This can be also called countercyclical. The correlation of this regression is negative, but is (R^2 = 0.07)not very strong. Also in this graph the different Betas are not very close to each other. The signification of this regression is 0.025; that means that the findings are correct with about 97.5 % confidence.

Figure 8



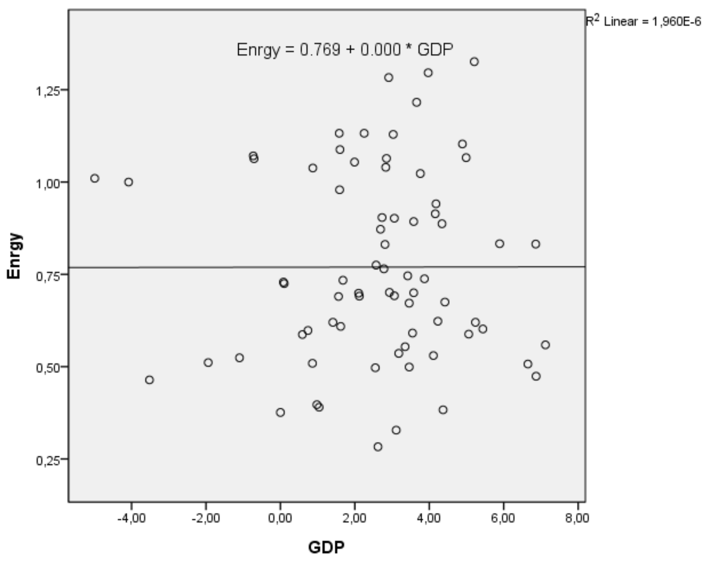
The next regression that I am going to analyze is the regression of the Manuf industry which is shown in the understanding figure. Also this regression line is negative, so that means that the Beta of this industry is countercyclical compared with the quarterly growth of the GDP. Also at this graph must be noted that the correlation of this regression line (R^2 =0.092) is not strong. The different values of the Beta are spread over the graph. The signification of this regression (0.01) is rather good because it means that the findings are made with 99 % confidence. This is the best signification of all the researched industries.

Figure 9



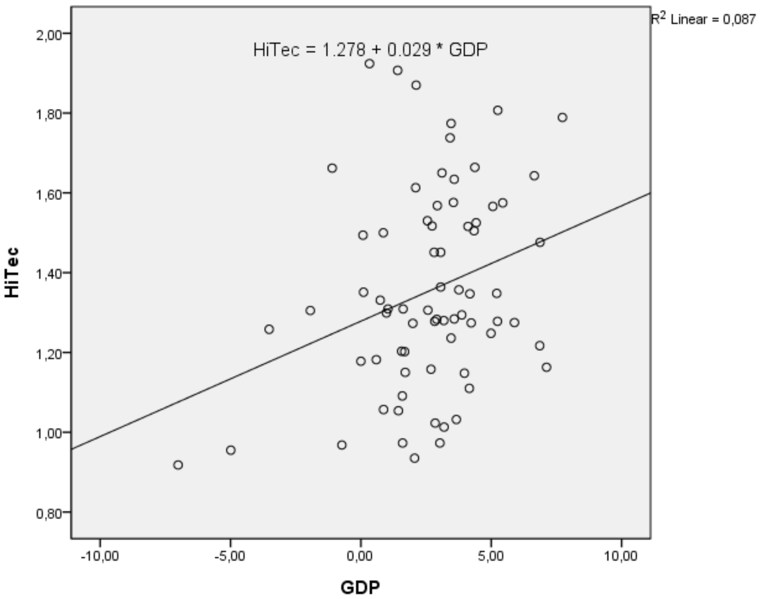
The understanding graph (figure 10) shows the regression of the Enrgy industry compared with the quarterly growth of the GDP. What immediately striking is the constant regression line. Thus that beta does not react to the economy. The correlation of this regression line is very small and close to zero. This means actually that there is no correlation, you can also see it on the R^2 of 1.9606-6. The spread of the different values of the Beta is very large. You can see it also on the signification. The signification is 0.991, in other words you could say that this regression is totally insignificant.

Figure 10



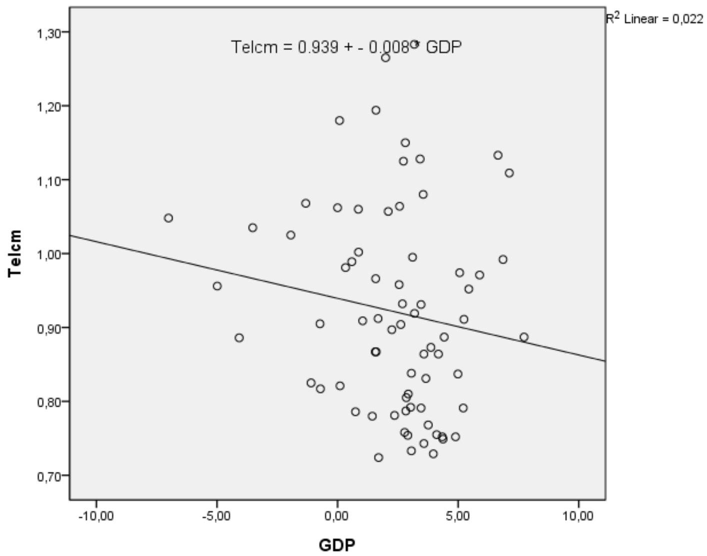
The next regression that I am going to analyze is the regression of the HiTec industry compared with the quarterly growth of the GDP (figure 11). The regression line is a positive line, so the Beta of the HiTec industry could be called as procyclical. Thus when the economy goes well, also the value of the beta will increase. Also in this findings must be noted that the correlation of the regression is (R^2 = 0.087) not strong. The signification of these findings is with 0.012 rather high. It means that the findings are done with about 99% confidence.

Figure 11



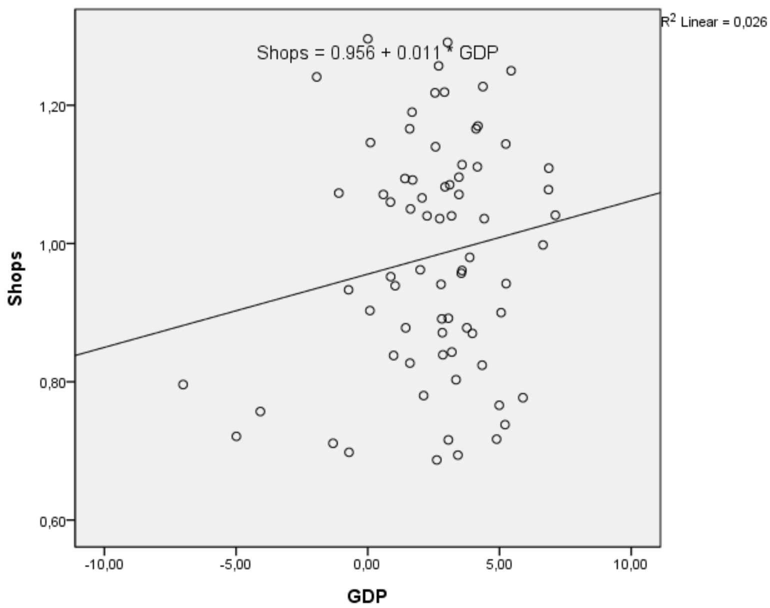
The following regression (figure 12) is from the Telcm industry. The regression line has a negative slope, what means that the Beta of the Telcm industry is countercyclical. But the r square (0.022) of this regression is so small, that you could also say that there is almost no correlation. Also the signification is with 0.216 not good. These findings are made with only 78% confidence while in most statistic researches a confidence of 95% is most likely.

Figure 12



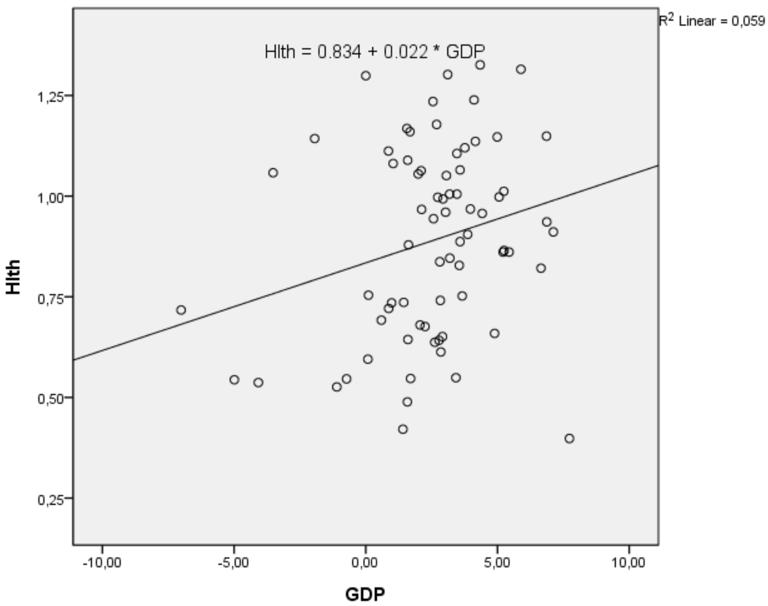
The next regression that I am going to analyze is from the industry shops (figure 13). The regression line has a positive slope, but also the r square of this regression is (0.026) very low. That means that also in this regression there is almost no correlation. But when we focus on the regression line, we could say that when the economy goes well also the value of the Betas will increase. With a signification of 0.175 the confidence is rather low.

Figure 13



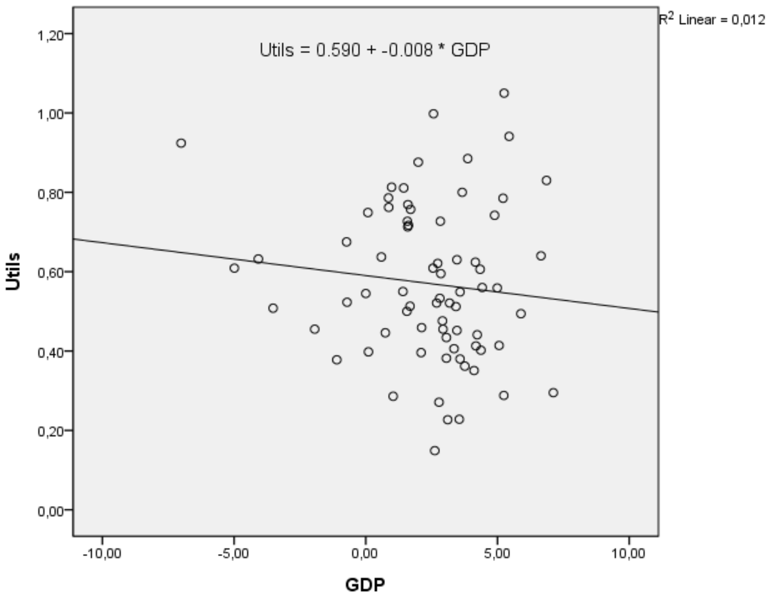
In the understanding graph (figure 14) you can see the regression of the Hlth industry compared with the quarterly growth rate of the GDP. The slope of the regression line is positive that means that the Beta of the Hlth industry is procyclical. But there must be noted that the r square of this regression is (0.059) not very strong. The signification is 0.04, so this findings are made with about 96% confidence, which is rather good.

Figure 14



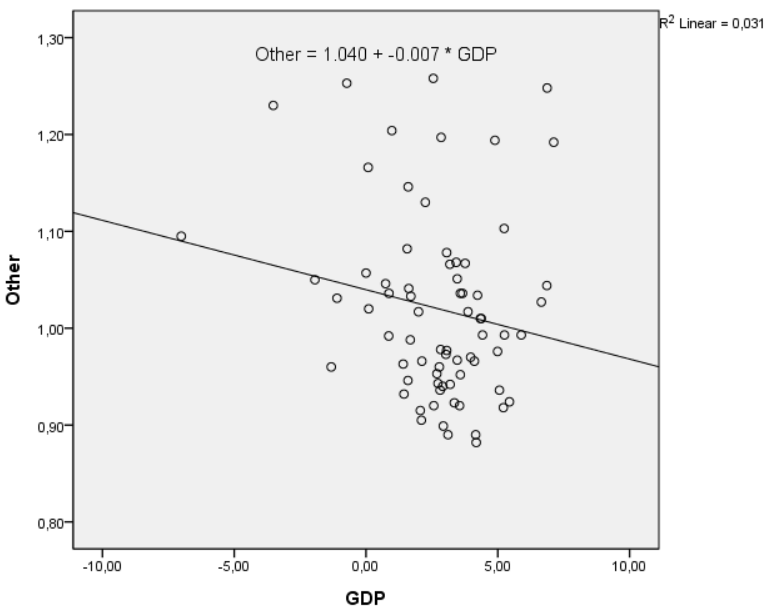
The following regression that I am going to analyze is the regression of the industry Utils compared with the quarterly growth of the GDP (figure 15). The slope of the regression line is negative. What means that when things in the economy go well the value of the Beta will decrease, but also here must be noted that the correlation of this regression is very low. There is almost no correlation between the values of the Betas, the r square is with 0.012 very low. The signification of this regression is with 0.362 not good, it means a confidence from less than 65%.

Figure 15



The last regression that I made is from the industry ‘ Other’ compared with the growth of the GDP (figure 16). The slope of the regression line is negative, which means that the Beta of the industry ‘Other’ is countercyclical to the economy. The spread of the different values of the Beta is very large, so also in this regression the correlation is not very strong, the r square is with 0.031 low. With a signification of 0.137 the confidence of this regression is with about 86% not very high.

Figure 16



After that I made the regressions per industry I also made a T-test per industry. With the information of the T-test it is possible to see witch results are made with the highest confidence. I estimate a T-inverse with 95% confidence and with 90% confidence. You have to read the value of the T-inverse (95%) as an interval of -1,990 and 1,990, if the T-value is outside the interval I can conclude that the results are made with at least 95% confident. The interval of T-inverse 90% is -1,664 – 1,664, if the T-value is outside the interval I can conclude that the results are made with at least 90% confidence. When I analyze the results of the T-test, I can say with 95% confidence that the results of the industries Durbl, Manuf, HiTec and Hlth are confident. With 90% confidence I can say that the result of the industry oDur is confident. You can see that the results of the T-test corresponds with the significance. The coefficient gives the slope of the regression line and the R^2 is a measure of the goodness of fit of the model. In the understanding table you can see the results per regression.

Summary of results

Industry	Coefficient	R^2	T-value	T- inverse (95%)	T-inverse (90%)	Significance
oDur	0,017	0,041	1,732	1,990	1,664	0,088
Durbl	-0,021	0,070	-2,288	1,990	1,664	0,025
Manuf	-0,013	0,092	-2,663	1,990	1,664	0,010
Enrgy	0	0,000	0,012	1,990	1,664	0,991
HiTec	0,029	0,087	2,583	1,990	1,664	0,012
Telcm	-0,008	0,022	-1,247	1,990	1,664	0,216
Shops	0,011	0,026	1,369	1,990	1,664	0,175
Hlth	0,022	0,059	2,096	1,990	1,664	0,040
Utils	-0,008	0,012	-0,918	1,990	1,664	0,362
Other	-0,007	0,031	-1,506	1,990	1,664	0,137

Figure 17

Chapter 5 Conclusion

In the literature overview all the relevant terms that are needed for the empirical research are discussed. The most important terms in this thesis are the (Conditional) CAPM and systematic risk. To summarize the difference between CAPM and Conditional CAPM you can say that by using the standard CAPM the Beta will be constant over time and when using the Conditional CAPM, the Beta is not constant over time, but will be fluctuating over time. The basic CAPM approach works very well in theory, but in practical we live in a dynamic world, and not all the assumptions of the basic CAPM are always valid. In practice it is a good option to use the Conditional CAPM, because we live in a dynamic world and Betas vary over time. The aim of this thesis is to link the Betas of several industries to the business cycle. Systematic risk is important to give an answer to the main question. Is the Beta that you use in the CAPM formula systematic risk or could it be reduced by information about the reaction of the Beta of several industries to the business cycle? In the empirical part I did research to this relation.

In the empirical part of this thesis are Betas estimated per industry and is research done to the correlation with the business cycle. From the 10 industry portfolios that I picked, the correlation with the GDP differs per industry. The industries ‘Hlth’ and ‘HiTec’ have the most positive correlations that give us the indication that they are procyclical to the business cycle. The industry ‘Other’ had the most negative correlation, this industry give us the indication that this industry is countercyclical to the business cycle. By estimating a regression per industry I checked again or there is a relation between the growth of the GDP and the value of the Beta of an industry. In the 10 estimated regressions there are four positive regressions lines, 5 negative regression lines and there is one regression that is constant. Off course, also here the industries ‘Hlth’ and ‘HiTec’ have a positive regression line, so here we can also say that these industries are procyclical to the business cycle. But also the regression lines of the industries ‘Odur’ and ‘Shops’ have a positive slope. Remarkable is the regression line of the ‘Enrgy’ industry because this line is constant. This indicates that whatever happened with the economy the value of the ‘Enrgy’ Beta will stay ‘constant’. The regression lines of all the other industries have a negative slope that means they are countercyclical to the business cycle. The information of the T-test is given the information that the most valuable results are from the industries Durbl, Manuf, HiTec

en Hlth. Especially the results of the industry Hlth are striking, because I expected before this research there would be no relation between the Hlth sector and the business cylce.
The information about the regression lines of several industries would give us the opportunity to reduce risk on investments, because we can split up the several industries in procyclical, non cyclical and countercyclical industries. The choice to invest in one of the industries depends on the expectation of the business cycle. During Booms, it would be a good opportunity to invest in procyclical industries and during recessions it would be useful to invest in countercyclical industries. Notable is that when I invest in a procyclical industry and the state of the economy goes to a recession the effect would also be more worse then the value of the business cycle. This counts also when I invest in a countercyclical industry and the state of the economy goes to a boom. The industry 'Enrgy' gives us the information that the value of the Beta from the industry Énrgy' is independent to the state of the economy, with this information we could not reduce risk from investments.
After this I say, that dependent to the business cycle investments can be done in most industries with lesser risk.
The problem with the conclusion of this research is that the r square of the regressions is not very high. A reason for that is that there are a lot of factors from influence to the value of a stock/portfolio. I think this research give us the information for approximations that investors have to make. So this information could help investors to reduce risk, but it is no certainty. There must be done more research to the relation of several industries to the business cycle to give a more valuable conclusion.

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Sources Data

- The Kenneth R French Data Library; for data about the market and date of industry portfolios
- The national bureau of economic research; Business cycle Dating Committee; for data of the quarterly growth of the Gross Domestic Product

Attachments

Betas per industry

	oDur	Durbl	Manuf	Enrgy	HiTec	Telcm	Shops	Hlth	Utils	Other
1990										
Quarter 1	1,086	1,109	1,035	0,914	1,110	1,367	1,111	1,136	0,624	0,890
Quarter 2	1,113	0,902	0,959	0,979	1,091	1,194	1,166	1,089	0,713	0,946
Quarter 3	1,270	1,031	1,124	0,376	1,178	1,062	1,296	1,299	0,545	1,057
Quarter 4	1,147	1,038	1,092	0,464	1,258	1,035	1,315	1,058	0,508	1,230
1991										
Quarter 1	1,092	1,106	1,112	0,511	1,305	1,025	1,241	1,143	0,455	1,050
Quarter 2	1,076	1,455	1,018	0,872	1,158	0,932	1,257	1,178	0,521	0,953
Quarter 3	1,127	1,290	1,051	0,734	1,202	0,912	1,190	1,160	0,513	0,988
Quarter 4	0,967	1,141	1,030	0,690	1,203	0,867	1,349	1,168	0,500	1,082
1992										
Quarter 1	1,054	1,266	0,850	0,383	1,664	0,749	1,227	1,390	0,402	1,010
Quarter 2	1,024	1,027	0,934	0,623	1,274	0,670	1,359	1,421	0,441	1,034
Quarter 3	0,933	1,797	1,185	0,530	1,516	0,755	1,166	1,239	0,351	0,966
Quarter 4	1,046	1,264	1,015	0,941	1,347	0,864	1,170	1,353	0,413	0,882
1993										
Quarter 1	0,957	1,312	0,911	0,598	1,331	0,786	1,305	1,499	0,446	1,046

Quarter 2	1,193	0,980	0,673	0,497	1,530	0,958	1,218	1,235	0,609	1,258
Quarter 3	1,100	1,276	0,926	0,699	1,613	1,057	1,347	1,063	0,396	0,905
Quarter 4	0,996	1,375	0,691	0,277	1,807	1,316	0,942	0,865	1,050	0,993
1994										
Quarter 1	0,762	1,296	1,048	0,738	1,294	0,873	0,980	0,905	0,885	1,017
Quarter 2	0,713	1,281	0,916	0,602	1,575	0,952	1,250	0,861	0,941	0,924
Quarter 3	0,848	1,587	1,029	0,775	1,306	1,064	1,140	0,944	0,998	0,920
Quarter 4	0,836	1,346	1,105	0,675	1,525	0,887	1,036	0,957	0,560	0,993
1995										
Quarter 1	0,836	1,174	1,017	0,397	1,299	1,385	0,838	0,735	0,813	1,204
Quarter 2	0,965	0,853	1,027	0,509	1,500	1,060	1,060	1,112	0,786	0,992
Quarter 3	0,320	1,266	0,990	0,554	2,689	0,630	0,803	0,245	0,406	0,923
Quarter 4	0,577	0,853	0,837	0,765	2,407	0,758	0,941	0,642	0,271	0,960
1996										
Quarter 1	0,912	0,926	0,955	0,904	1,517	1,125	1,036	0,997	0,621	0,943
Quarter 2	1,029	0,758	0,825	0,832	1,217	0,992	1,078	1,149	0,830	1,044
Quarter 3	0,808	0,997	0,908	0,499	1,774	0,931	1,096	1,005	0,452	0,967
Quarter 4	0,968	0,797	0,854	0,887	1,505	0,752	0,824	1,326	0,606	1,010
1997										

Quarter 1	0,946	0,674	0,928	0,692	1,364	0,733	0,716	1,476	0,434	1,078
Quarter 2	1,173	0,784	0,955	0,833	1,275	0,971	0,777	1,315	0,494	0,993
Quarter 3	1,034	0,727	1,055	1,066	1,248	0,837	0,766	1,147	0,559	0,976
Quarter 4	0,868	0,880	0,954	0,902	1,451	0,838	0,892	1,051	0,382	0,977
1998										
Quarter 1	0,773	0,916	0,932	1,023	1,357	0,768	0,878	1,120	0,362	1,067
Quarter 2	0,859	0,784	0,977	0,893	1,284	0,864	0,961	1,065	0,380	1,036
Quarter 3	0,763	0,990	0,901	0,620	1,278	0,911	1,144	1,012	0,288	1,103
Quarter 4	0,542	1,153	0,851	0,474	1,476	0,589	1,109	0,936	0,060	1,248
1999										
Quarter 1	0,652	0,900	0,766	0,591	1,576	1,080	0,957	0,828	0,228	0,920
Quarter 2	0,553	0,390	0,469	0,328	1,650	0,995	1,085	1,302	0,227	0,890
Quarter 3	0,521	0,750	0,686	0,588	1,566	0,974	0,900	0,998	0,414	0,936
Quarter 4	0,704	0,721	0,739	0,559	1,163	1,109	1,041	0,911	0,295	1,192
2000										
Quarter 1	0,596	0,625	0,819	0,390	1,309	0,909	0,939	1,081	0,286	0,873
Quarter 2	0,264	0,428	0,571	0,128	1,789	0,887	0,486	0,398	0,080	0,671
Quarter 3	0,067	0,429	0,605	-0,063	1,924	0,981	0,443	0,189	0,074	0,746
Quarter	-0,007	0,691	0,599	0,031	2,143	0,781	0,666	0,234	0,027	0,807

4										
2001										
Quarter 1	0,111	0,598	0,616	0,025	2,118	1,068	0,711	0,376	0,069	0,960
Quarter 2	0,364	0,697	0,782	0,283	2,174	0,904	0,687	0,637	0,149	0,831
Quarter 3	0,395	1,387	1,059	0,524	1,662	0,825	1,073	0,526	0,378	1,031
Quarter 4	0,398	1,124	0,954	0,620	1,907	0,710	1,094	0,421	0,550	0,963
2002										
Quarter 1	0,344	1,001	0,907	0,746	1,738	1,128	0,694	0,549	0,512	1,068
Quarter 2	0,410	0,778	0,794	0,691	1,870	1,318	0,780	0,967	0,459	0,966
Quarter 3	0,604	0,950	0,809	1,054	1,273	1,265	0,962	1,055	0,876	1,017
Quarter 4	0,462	1,201	0,929	0,729	1,494	1,180	0,903	0,595	0,749	1,166
2003										
Quarter 1	0,694	1,193	0,924	0,609	1,309	1,400	1,050	0,879	0,717	1,041
Quarter 2	0,718	1,142	0,935	0,536	1,280	1,283	1,040	1,005	0,521	1,066
Quarter 3	0,465	0,999	0,870	0,507	1,643	1,133	0,998	0,821	0,640	1,027
Quarter 4	0,628	1,074	0,930	0,700	1,634	0,743	1,114	0,887	0,549	0,952
2004										
Quarter 1	0,553	1,246	1,020	0,831	1,451	1,150	0,891	0,837	0,533	0,936
Quarter 2	0,524	1,340	1,057	1,040	1,278	0,787	0,871	0,741	0,727	0,978

Quarter 3	0,633	1,198	1,077	0,701	1,568	0,810	1,082	0,993	0,455	0,899
Quarter 4	0,927	1,206	1,029	0,672	1,236	0,791	1,071	1,106	0,630	1,051
2005										
Quarter 1	0,797	1,114	1,090	1,296	1,148	0,729	0,870	0,968	1,105	0,970
Quarter 2	0,744	1,551	1,233	1,460	1,150	0,724	1,092	0,547	0,757	1,033
Quarter 3	0,836	1,025	1,086	1,129	0,973	0,792	1,291	0,960	1,120	0,973
Quarter 4	0,614	1,177	1,000	1,847	0,935	0,721	1,066	0,680	1,274	0,915
2006										
Quarter 1	0,654	0,965	1,048	1,326	1,348	0,791	0,738	0,861	0,785	0,918
Quarter 2	0,561	1,021	1,171	1,489	1,054	0,780	0,878	0,736	0,811	0,932
Quarter 3	0,501	1,323	1,289	0,725	1,351	0,821	1,146	0,754	0,398	1,020
Quarter 4	0,693	1,239	1,081	1,283	1,283	0,754	1,219	0,651	0,476	0,940
2007										
Quarter 1	0,754	1,044	1,030	1,038	1,057	1,002	0,952	0,721	0,762	1,036
Quarter 2	0,753	0,979	0,979	1,399	1,013	0,919	0,843	0,846	1,224	0,942
Quarter 3	0,738	1,118	0,997	1,132	0,884	0,897	1,040	0,676	1,067	1,130
Quarter 4	0,684	1,158	0,969	1,064	1,023	0,805	0,839	0,613	0,595	1,197
2008										
Quarter 1	0,674	1,228	0,976	1,071	0,968	0,905	0,933	0,546	0,675	1,253

Quarter 2	0,601	1,433	1,012	0,587	1,182	0,989	1,071	0,692	0,637	1,343
Quarter 3	0,539	1,100	0,857	1,000	0,894	0,886	0,757	0,537	0,632	1,590
Quarter 4	0,709	1,128	0,989	1,341	0,918	1,048	0,796	0,717	0,924	1,095
2009										
Quarter 1	0,532	1,320	0,979	1,010	0,955	0,956	0,721	0,544	0,609	1,496
Quarter 2	0,478	1,573	1,135	1,063	0,768	0,817	0,698	0,330	0,523	1,495
Quarter 3	0,524	1,406	1,061	1,132	0,886	0,966	0,679	0,489	0,727	1,280
Quarter 4	0,596	1,314	1,136	1,103	0,869	0,752	0,717	0,659	0,742	1,194
2010										
Quarter 1	0,691	1,318	1,092	1,216	1,032	0,831	0,664	0,752	0,800	1,036
Quarter 2	0,648	1,416	1,073	1,088	0,973	0,867	0,827	0,644	0,769	1,146
Quarter 3	0,666	1,503	1,080	1,021	0,977	0,821	0,872	0,744	0,716	1,243
Quarter 4	0,644	1,353	1,074	1,177	0,977	0,726	0,738	0,699	0,594	1,183

Outcomes SPSS per industry

Odur

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	,693	,034		20,098	,000
	GDP	,017	,010	,203	1,732	,088

a. Dependent Variable: Odur

DurbL

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1,136	,033		34,456	,000
	GDP	-,021	,009	-,264	-2,288	,025

a. Dependent Variable: Durbl

Manuf

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	,990	,017		57,804	,000
	GDP	-,013	,005	-,303	-2,663	,010

a. Dependent Variable: Manuf

Enrgy

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	,769	,046		16,883	,000
	GDP	,000	,013	,001	,012	,991

a. Dependent Variable: Enrgy

HiTec

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1,278	,041		31,187	,000
	GDP	,029	,011	,295	2,583	,012

a. Dependent Variable: HiTec

Telcm

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	,939	,022		42,973	,000
	GDP	-,008	,006	-,147	-1,247	,216

a. Dependent Variable: Telcm

Shops

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	,956	,028		34,384	,000
	GDP	,011	,008	,161	1,369	,175

a. Dependent Variable: Shops

Hlth

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	,834	,038		21,960	,000
	GDP	,022	,010	,243	2,096	,040

a. Dependent Variable: Hlth

Utils

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	,590	,032		18,616	,000
	GDP	-,008	,009	-,109	-,918	,362

a. Dependent Variable: Utils

Other

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	1,040	,017		60,861	,000
	GDP	-,007	,005	-,177	-1,506	,137

a. Dependent Variable: Other